AF/2814 PATENT APPLICATION

Attorney Docket: 99 P 7476 US 02 (8055-53)

In re application of: Clevenger et al.

Serial No.: 09/052,688 Group: Art Unit 2814

Filed: March 31, 1998 Examiner: Peralta, Ginette

For: IMPROVED DEVICE INTERCONNECTION

Corres. and Mail BOX AF

Assistant Commissioner for Patents
Washington, D.C. 20231

AMENDMENT TRANSMITTAL FORM

Sir:

Transmitted herewith is an amendment in the above-identified application.

[ ] Small entity status of this application under 37 C.F.R. § 1.9 and 1.27 has been established by a verified statement previously submitted.

[ ] A verified statement to establish small entity under 37 C.F.R. § 1.9 and 1.27 is enclosed.

[X] No additional fee is required.

The fee has been calculated as shown below:

	(Col. 1) CLAIMS REMAINING AFTER AMENDMENT		(Col. 2) HIGHEST NO. PREVIOUSLY PAID FOR	(Col. 3) PRESENT EXTRA	SMALL ENTITY RATE	ADDIT. FEE	OR	OTHER THAN SMALL ENTITY RATE	ADDIT. FEE
TOTAL	27*	MINUS	27**	= 0	X 9	$ 0		X 18	$ 0
INDEP.	2*	MINUS	3***	= 0	X 42	$ 0		X 84	$ 0
☐ FIRST PRESENTATION OF MULTIPLE DEP. CLAIM					X 140	$		X 280	$ 0
					TOTAL ADDIT. FEE	$ 0		OR TOTAL	$ 0

* If the entry in Co. 1 is less than entry in Col. 2, write "0" in Col. 3.

** If the "Highest No. Previously Paid for" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest No. Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The Highest No. Previously Paid For" (Total or indep.) is the highest number found in the appropriate box in Col. 1 of a prior amendment or the number of claims originally filed.

[ ] Please charge Deposit Account No. _____ in the amount of $_____. Two (2) copies of this sheet are enclosed.

[ ] Please charge fee of $_____ for _____ by Credit Card Payment Form PTO-2038 enclosed herewith

[X] Please charge any deficiency as well as any other fee(s) which may become due under 37 C.F.R. § 1.16 and/or 1.17 at any time during the pendency of this application, or credit any overpayment of such fee(s) to Deposit Account No. 50-0679. Also, in the event any extensions of time for responding are required for the pending application(s), please treat this paper as a petition to extend the time as required and charge Deposit Account No. 50-0679 therefor. TWO (2) COPIES OF THIS SHEET ARE ENCLOSED.

Respectfully submitted,

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CERTIFICATE OF MAILING UNDER 37 C.F.R. §1.8(a)

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail, postpaid in an envelope, addressed to the: Assistant Commissioner for Patents, Washington, D.C. 20231 on December 23, 2002.

Dated: 12/23/02

Frank V. DeRosa

#33/Response 2-4-03 CMoore

RESPONSE UNDER 37 CFR § 1.116
-EXPEDITED PROCEDURE-
EXAMINING GROUP ART GROUP UNIT 2814

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: Clevenger et. al.

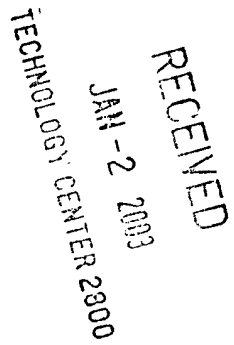
Examiner: Peralta, Ginette

Serial No: 09/052,688

Group Art Unit: 2814

Filed: March 31, 1998

Docket: 98P7476US01
(8055-53)



For: **IMPROVED DEVICE INTERCONNECTION**

Commissioner of Patents
Washington, D.C. 20231

RESPONSE

This is a response to a Final Office Action mailed on October 22, 2002. Claims 1-5 and 7-15 are pending in the application and stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Teong (US Pat. 5,693,563) in view of Hegde et al. (US Pat. 6,136,682). Applicants respectfully request reconsideration of the claim rejections based on the following remarks.

To establish a prima facie case of obviousness against claim 1, at the very least, the combination of Teong and Hedge must teach or suggest all the claim limitations of claim 1. Here, it is respectfully that the combination does not teach or suggest a first or second *liner layer*

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Dated: 12/23/02

Frank DeRosa

[that] *imparts a random grain orientation in the conductive material of the conductor to improve electromigration lifetime of the conductor*, as essentially claimed in claim 1.

Indeed as acknowledge by the Examiner on page 3 of the Final Office Action, Teong does not disclose a liner layer of an amorphous character that would impart a random grain orientation to the conductive material to improve electromigration lifetime of the conductor. However, it is respectfully submitted that Examiner's reliance on Col. 3, lines 1-24 of Hedge as disclosing a first or second *liner layer* [that] *imparts a random grain orientation in the conductive material of the conductor to improve electromigration lifetime of the conductor*, as essentially claimed in claim 1, is misplaced.

In contrast, Hedge discloses in the cited section a composite film overlying a copper layer to improve barrier properties by preventing copper from diffusing into the substrate at excessive temperatures. In particular, Hedge discloses that the *composite TaN/TiN film stack results in an excellent barrier to copper diffusion over greater thermal ranges than available in the prior art* (see Hedge, col. 3, lines 12-14; Abstract). The solution presented by Hedge is to prevent copper from readily diffusing through silicon layers and effecting dielectric constants of insulating material and impairing electrical operation of transistors, (see Col. 1, line 18-23).

There is nothing in the cited section or anywhere in Hedge that discloses or suggest imparting a random grain orientation in the conductive material of the conductor to improve electromigration lifetime of the conductor. It is well known to one of ordinary skill in the art that electromigration is the result of high current density in metallic conductors. This causes the metal atoms to pile up in the direction of the electron flow and produce voids upstream with respect to the electron flow. The transport of metal atoms is due to the momentum imparted on the metal

atoms by a great deal of electron collisions to move the atom from one vacancy to a neighboring vacancy thereby gradually forming atom migration. Hedge does not address the problem of increasing the electromigration lifetime of the conductor.

Therefore, the combination of Teong and Hedge does not disclose a first or second *liner layer imparts* [that] *a random grain orientation in the conductive material of the conductor to improve electromigration lifetime of the conductor*, as essentially claimed in claim 1. Thus, the combination of Teong and Hedge does not establish a prima facie case of obviousness.

Claims 2-5 and 7-15 depend, directly or indirectly, from claim 1. Since these dependent claims depend from independent claim 1, the dependent claims include the elements of the independent claim; Therefore, the dependent claims are allowable for the same reasons given for the independent claims.

In view of the foregoing amendment and remarks, it is respectfully submitted that all the claims now pending in the application are in condition for allowance. Early and favorable reconsideration of the case is respectfully requested.

Respectfully submitted,

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